MEASUREMENT OF DISEASE

Pl Path 111 (3+1)

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Why disease measurement?

- To know the prevalence and extent of damage caused by a disease
- To develop effective management strategies
The three categories of disease damage

- The whole plant is killed/damaged
- Localized part of plant or the field is affected.
- The effect of disease outbreak persists over several seasons.
Disease is measured in terms of **intensity**. Disease intensity can be expressed either as:

- **disease incidence** or
- **disease severity**.

The choice between evaluation of disease according to its **incidence** or **severity** depends largely on the type of disease and on the objectives.
Disease incidence

It is the percentage of diseased plants or parts in the sample or population of plants.

It can be the proportion or percentage of diseased leaves in a plant, diseased stalks or a tiller or diseased seedlings in a field.

Disease incidence: \[\text{No. of infected plants} \times 100\]

\[\text{Total no. of plant assessed}\]
Disease evaluation according to the incidence is suitable for:

- most diseases in the early stages of their epidemic and
- it applies mainly to diseases which affects whole plants such as systemic virus diseases, wilts, smuts, fruits rots etc.

- Disease incidence generally tells about the prevalence of the disease in a given areas or host population.
Disease Severity

Disease severity is the percentage of relevant host tissues or organ covered by symptom or lesion or damaged by the disease. Severity results from the number and size of the lesions.

- DS is more appropriate in diseases like rusts, downy and powdery mildews, leaf spots and other similar disease.

- DS tells about the extent of damage caused by the disease.
Disease severity or Infection index

\[ = \text{Sum of all disease rating} \times 100 \]
\[ \text{Total no. of rating} \times \text{maximum disease grade} \]
Visual assessment methods

- Standard area diagrams
- Descriptive keys
Standard area diagrams

- Standard area diagrams allow estimation of intermediate levels of disease severity by comparing a diseased plant with diagrams showing both more and less disease.

- These diagrams have been prepared for various diseases.

- Here the pictorial representation of the host plant with known and graded amounts of disease is compared with diseased leaves to allow estimation of disease severity.

- Standard area diagrams e.g. leaf rust of wheat provide 1, 5, 10, 20, 50% leaf area infected.
Standard area diagrams used to estimate A. leaf rust of cereals, B. stem rust of cereals.
Standard area diagram C. *Septoria glume blotch* of wheat, D. *late blight* of potatoes
Descriptive scales

- For assessing the disease severity the descriptive keys have also been standardized for various diseases.

- Here the pictorial diagrams of the plants with varying amounts of types of disease symptoms are categorized with descriptions.

- These are widely used and are of many types ranging from disease rating on numerical scale to subjective estimates as severe, moderate etc.
<table>
<thead>
<tr>
<th>Severity</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>No disease on leaf and pods</td>
</tr>
<tr>
<td>1</td>
<td>Small brown spot covering &lt;1% leaf area (pin point spots on pod)</td>
</tr>
<tr>
<td>3</td>
<td>Brown sunken spots 1-10% leaf area (&lt; 1% pod area)</td>
</tr>
<tr>
<td>5</td>
<td>Brown spots 11-25% leaf area (1-10% pod areas)</td>
</tr>
<tr>
<td>7</td>
<td>Circular brown sunken spots 26-50% leaf area (11-25% pod area)</td>
</tr>
<tr>
<td>9</td>
<td>Circular to irregular &gt;51% leaf area (&gt;26% pod area)</td>
</tr>
<tr>
<td>Disease grade</td>
<td>Total rating</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
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<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
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<td>4</td>
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<tr>
<td>7</td>
<td>8</td>
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<tr>
<td>9</td>
<td>4</td>
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**Sum of all ratings = 186; total ratings = 34**

**Max. Disease grade = 9**

**Dis. Severity = \( \frac{186}{34 \times 9} \times 100 \) = 60%**